# Science

## Year 9: Inheritance, evolution & ecosystems

| Assessment Opportunities | Literacy/Reading opportunities | CEIAG Links |
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| • Regular low stakes quizzing of AO1- self marked.<br>• In class past paper questions where – self / peer marked<br>• Extended writing is teacher marked with personalised feedback provided.<br>• End of unit assessment self & teacher marked with collective feedback provided. | **Reciprocal reading:** Discovering the structure of DNA<br><br>**Key vocab is highlighted in the SOL** | **Spotlight on careers:** Genetic counsellor<br><br>Other careers:<br>• Geneticist<br>• Biotechnologist<br>• Conservation biologist<br>• Forensic scientist<br>• Agricultural scientist |

Curriculum vision:

"Our aim is to deliver a curriculum that is inclusive, relevant and progressive for all learners."

**KS3 Inheritance & evolution**

**Big Picture:**
This unit on Inheritance and Evolution provides students with a foundational understanding of how traits are inherited, how species evolve, and how organisms interact within ecosystems. The knowledge and skills acquired in this unit are not only essential for academic progression but also highly relevant to understanding and addressing real-world issues in medicine, agriculture, environmental science, and conservation.

| **Lesson sequence** | **Learning outcomes / Key knowledge (including NC KS3)**<br>Interleave / review<br>Scaffold | **Skills development:**<br>Reading / writing / data / numeracy / graph work | **Spec / book reference** |
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| 1. **TBAT:** Describe the organisation of DNA, Genes, and Chromosomes | • DNA is the molecule that contains genetic information.<br>• Genes are segments of DNA that code for proteins.<br>• Chromosomes are long strands of DNA coiled up, containing many genes.<br>• **A simple model of chromosomes, genes and DNA in heredity, including the part played by Watson, Crick, Wilkins and Franklin in the development of the DNA model**<br>○ Structure of eukaryotic cells.<br>○ Organisation from cells to organisms<br>○ Use visual aids like diagrams and videos.<br>○ Provide knowledge organisers / key vocab with definitions | • **Label** diagram of chromosome<br>• **Identify** functional parts of chromosomes<br>• **Describe** how DNA is organised in eukaryotic cells | **Spec**<br>**NC pos here pg7**<br>**Boost book 3 pg 50** |
| 2. **TBAT:** Engage with a scientific article | • **A simple model of chromosomes, genes and DNA in heredity, including the part played by Watson, Crick, Wilkins and Franklin in the development of the DNA model**<br>○ Uses of X rays<br>○ Ethics & sharing work<br>○ Reading rulers, tracking as teacher reads<br>○ Larger text chunked as needed.<br>○ Modelling highlighting & annotation of text | • **Reciprocal reading**<br>Discovering the structure of DNA | **Spec**<br>**NC pos here pg7**<br>**Boost book 3 pg 50** |

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| 3. **TBAT:** Describe different types of variation | • **differences between species**<br>• **the variation between individuals within a species being continuous or discontinuous**<br>• Continuous variation: Traits that show a range of values (e.g., height).<br>• Discontinuous variation: Traits that have distinct categories (e.g., blood type).<br>• Variation can be environmental, inherited or a combination of both.<br><br>○ Images / dual coding<br>○ Model example sort / comparison | • **Sort:** Characteristics based on type of variation shown<br>• **Justify:** groupings<br>• **Compare:** use key features to give similarities and differences between type of variation. | **Spec NC pos here pg7**<br><br>**Boost book 3 pg 55-58** |
| 4. **TBAT:** Collect & present data on variation | • **differences between species**<br>• **the variation between individuals within a species being continuous or discontinuous**<br>• **to include measurement and graphical representation of variation**<br>• Methods of data collection (e.g., surveys, observations, measurements).<br>• Data presentation techniques (e.g., charts, graphs).<br><br>○ Measurements<br>○ Graph skills<br><br>○ Use pre-drawn table outlines & graph axes*<br>○ Provide exemplar data to plot<br>○ Demonstrate methods of collecting data / dual coding<br>○ Model collection of data<br>○ Model construction of tables & graphs | • **Select:** Appropriate ways to display data, appropriate scales and intervals to use<br>• **Plot:** tally chart, histogram, scatter plot<br>• **Measure:** Make precise measurements<br><br>**Graph work: select parameters for and produce tally charts, histograms, scatter plots, scales independently*** | **Spec NC pos here pg7**<br><br>**Boost book 3 pg 58** |
| 5. **TBAT:** Use Punnett squares to show genetic crosses. | • **heredity as the process by which genetic information is transmitted from one generation to the next**<br>• Basics of genetic crosses and inheritance.<br>• Idea of alleles; dominant and recessive<br>• 2 copies of each gene; one from each parent<br>• Random combination of alleles during fertilisation<br>• How to construct and interpret a Punnett square.<br><br>○ Reproduction / fertilisation<br>○ Gametes have ½ DNA | • **Draw:** Punnett squares given genetic information about parents.<br>• **Calculate:** Probability of different characteristics in offspring | **Spec NC pos here pg7**<br><br>**Boost book 3 pg 51-52** |

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| | Multiplication grids in maths (similar concept)<br><br>○ Use simplified Punnett square examples.<br>○ Provide templates for constructing Punnett squares.<br>○ Images to show physical characteristics<br>○ Model completing and analysing Punnett squares. | | |
| 6. **TBAT:** Describe common adaptations of plants and animals. | • **the variation between species and between individuals of the same species means some organisms compete more successfully, which can drive natural selection**<br>• Factors that plants and animals compete for.<br>• Animal adaptations to include camouflage, adaptations to cold, predator & prey adaptations.<br>• Plant adaptations to include to low water availability.<br><br>○ Surface area: volume<br>○ Photosynthesis & respiration<br>○ Stomata<br>○ Energy transfer by heating & radiation<br><br>○ Use images & dual coding<br>○ Provide access to key terms & definitions | • **Name:** Resources that plants & animals compete for<br>• **Identify:** Adaptations to different environments / niches<br>• **Explain:** Link adaptation to how it increases survival chances. | **Spec NC pos here pg7**<br><br>**Boost book 3 pg 59-61** |
| 7. **TBAT:** Describe the process of natural selection. | • **the variation between species and between individuals of the same species means some organisms compete more successfully, which can drive natural selection**<br>• Definition of natural selection<br>• Mechanism of natural selection<br>• Examples of natural selection in action<br><br>○ Review reproduction in plants & animals<br>○ Genetic information from parents<br><br>○ Use visual aids and clear, concrete examples<br>○ Simplify the explanation of mechanisms with diagrams<br>○ Provide practice scenarios for better understanding | • **Describe:** process of natural selection<br>• **Writing:** How species arose by natural selection. | **Spec NC pos here pg7**<br><br>**Boost book 3 pg 58-62** |

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| 8. **TBAT:** Describe the processes that drive evolution and extinction. | • **changes in the environment may leave individuals within a species, and some entire species, less well adapted to compete successfully and reproduce, which in turn may lead to extinction**<br>• Definition of evolution and extinction<br>• Factors contributing to evolution<br>• Causes and examples of extinction events<br>  ○ Climate change<br>  ○ Air pollution<br>  ○ Fossils<br>  ○ Use historical and contemporary examples to illustrate concepts | • **Predict:** Fate of species following certain environmental changes.<br>• **Evaluate:** Impact of climate change on species survival<br>• **Identify:** Factors that drive evolution and lead to extinction | **Spec NC pos here pg7**<br>**Boost book 3 pg 68-69** |
| 9. **TBAT:** Describe interdependence in ecosystems | • **the interdependence of organisms in an ecosystem, including food webs and insect pollinated crops**<br>• **the importance of plant reproduction through insect pollination in human food security**<br>• **how organisms affect, and are affected by, their environment, including the accumulation of toxic materials.**<br>• Definition of interdependence<br>• Levels of organisation in ecosystems<br>  ○ Pollination as part of plant sexual reproduction<br>  ○ Air & water pollution, disposal of plastic<br>  ○ Use images with dual coding<br>  ○ Use well known examples | • **Define:** interdependence<br>• **Construct:** food chains & webs<br>• **Identify:** Levels of organisation within ecosystems<br>• **Describe:** effect of different factors on food supply | **Spec NC pos here pg7**<br>**Boost book 3 pg 66-67** |
| 10. **TBAT:** Explain the importance of maintaining biodiversity | • **the importance of maintaining biodiversity and the use of gene banks to preserve hereditary material.**<br>• **the importance of plant reproduction through insect pollination in human food security**<br>• Definition of biodiversity<br>  ○ Genes as sections of DNA that code for proteins<br>  ○ Limited source of DNA – from parents | • **Define:** biodiversity<br>• **Identify:** Useful products from plants & animals<br>• **Explain:** Different ways to maintain biodiversity | **Spec NC pos here pg7**<br>**Boost book 3 pg 70-71** |

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<tr><td></td><td colspan="2">
<ul>
<li>Use images with dual coding</li>
<li>Use well known examples</li>
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</td><td></td><td></td></tr>
<tr><td colspan="3">Vocab</td><td>Links to previous learning / interleaving</td><td>Assessment & homework</td></tr>
<tr><td colspan="3">
<table>
<tr><td>L3 Vocab</td><td>Tally chart</td><td>L2 Vocab</td><td>Command words focus</td></tr>
<tr><td>DNA</td><td>Histogram</td><td>Characteristic</td><td>Label</td></tr>
<tr><td>Genes</td><td>Scatter plot</td><td>Environment</td><td>Plot</td></tr>
<tr><td>Chromosomes</td><td>Punnett Square</td><td>Annotate</td><td>Measure</td></tr>
<tr><td>Inheritance</td><td>Mutation</td><td>Segment</td><td>Predict</td></tr>
<tr><td>Punnett square</td><td>Adaptation</td><td>Section</td><td>Identify</td></tr>
<tr><td>Probability</td><td>Competition</td><td>Code</td><td>Estimate</td></tr>
<tr><td>Variation</td><td>Ecosystem</td><td>Coiled</td><td>Observe</td></tr>
<tr><td>Species</td><td>Survive</td><td>Ethics</td><td>Justify</td></tr>
<tr><td>Natural Selection</td><td>Reproduce</td><td>Category</td><td>Evaluate</td></tr>
<tr><td>Evolution</td><td>Alleles</td><td>Distinct</td><td>Compare</td></tr>
<tr><td>Extinction</td><td>Dominant</td><td>Combine</td><td>construct</td></tr>
<tr><td>Double helix</td><td>Recessive</td><td>Technique</td><td></td></tr>
<tr><td>Molecule</td><td>Populations</td><td>Mechanism</td><td></td></tr>
<tr><td>Continuous</td><td>Community</td><td>Accumulate</td><td></td></tr>
<tr><td>Discontinuous</td><td>Ecosystem</td><td>Disposal</td><td></td></tr>
<tr><td>Environmental</td><td>Interdependence</td><td>Toxic</td><td></td></tr>
<tr><td></td><td>Pollination</td><td></td><td></td></tr>
<tr><td></td><td>Food security</td><td></td><td></td></tr>
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KS3 cells and reproduction
<ul>
<li>Cells & organisation</li>
<li>Sexual and asexual reproduction in plants and animals</li>
<li>Human reproductive system</li>
</ul>
KS2
<ul>
<li>Living things and their habits</li>
<li>Plants</li>
<li>Animals including humans</li>
<li>Classification</li>
<li>Life cycles</li>
<li>Adaptation</li>
<li>Heredity</li>
<li>Evolution and inheritance</li>
</ul>
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<ul>
<li>Regular low stakes quizzing of AO1</li>
<li>In class assessment of AO1, AO2, AO3 using past paper questions where appropriate</li>
<li>Written word is assessed with personalised feedback provided.</li>
<li>End of unit assessment marked with collective feedback provided.</li>
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Homework is set weekly and is outlined in the half-termly homework booklet.<br>Homework includes
<ul>
<li>online quizzes on Carousel</li>
<li>Learning of content for in-class quizzes</li>
<li>Completion of written questions.</li>
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<tr><td colspan="4">Independent learning<br><br>BBC Bitesize KS3 – Inheritance & genetics<br>https://www.bbc.co.uk/bitesize/topics/zpffr82<br>BBC Bitesize KS3 – Ecosystem & habitats<br>https://www.bbc.co.uk/bitesize/topics/zxhhvcw<br><br>YouTube revision monkey KS3<br>Inheritance: https://www.youtube.com/watch?v=iBoXpURc1es</td><td>Misconceptions / common errors
<ul>
<li>DNA and genes are the same thing</li>
<li>Genes are inherited from other family members</li>
<li>Individuals evolve during their lifetime</li>
<li>Natural selection involves organisms trying to adapt</li>
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| Variation: https://www.youtube.com/watch?v=DjGZp_lU5EY<br>Natural selection: https://www.youtube.com/watch?v=MX3KJMu_Gq0<br>Extinction: https://www.youtube.com/watch?v=-7hQk9mN1Co<br>Ecosystems: https://www.youtube.com/watch?v=ZXb90uJSHQQ<br>Food chains & food webs: https://www.youtube.com/watch?v=jB6MVrYxrx8<br>Disruption to food webs: https://www.youtube.com/watch?v=e5_ddd1hlBg<br>Competition & adaptation: https://www.youtube.com/watch?v=rNmyq8NPgSI&t=274s | • Environmental variation can be passed down through DNA.<br>• Plants don't carry out sexual reproduction<br>• All plants and animals are equally important in ecosystems<br>• We only need to protect endangered species. |